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Metro/T.T.C.

Downtown Rapid Transit Study

Report 2.03

SUMMARY REPORT

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Downtown Rapid Transit Project

Metropolitan Planning Department
Metropolitan Roads & Traffic Department
Toronto Transit Commission

365 Bay Street, Suite 408
Toronto, Ontario M5H 2V1
947-8803

April 3, 1985

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TO: The Metropolitan Toronto Technical Transportation Planning Committee

FROM: D. J. Morton

RE: Downtown Rapid Transit Study

At its meeting of June 21, 1983 the Council of Metropolitan Toronto, in adopting Clause No. 1 in Joint Report 1, of the Transportation Committee and the Economic Development and Planning Committee, approved the Terms of Reference for a Downtown Rapid Transit Feasibility Study.

The design for this Study provided for two separate phases:

Phase 1 - Problem Definition - was completed in May 1984. Its findings are presented in DRT Report 2.01 - Problems and Issues to 2001.

Phase 2 - Solution Development - was recently completed. Its findings are documented in DRT Report 2.02 - Alternative Solutions (Functional Design and Evaluation).

I am pleased to submit DRT Report 2.03 - Summary Report, which reviews the findings of Phases 1 and 2 and recommends an undertaking to construct a Rapid Transit Line from Spadina Avenue and Front Street to Danforth Avenue and Pape Avenue along a Front-Railway-Eastern-Pape alignment, at an estimated cost of $538 million, including construction, vehicles and property.

With respect to employment and other benefits, it has been estimated that construction of the recommended line would create over 14,000 person years of employment and return a total of $208 million to the various levels of government in the form of taxes.

In submitting this report, I wish to acknowledge the assistance of the Study participants from the Planning Branch and the Engineering and Construction Branch of the Toronto Transit Commission, the Metropolitan Toronto Planning Department, and the Metropolitan Toronto Roads and Traffic Department. Additionally, the direction of the DRT Planning Review Committee, representing the Planning and Public Works Departments of the City of Toronto, the Planning Departments of the Borough of East York, City of York and Metropolitan Toronto, the Ministry of Transportation and Communications, the Ministry of Environment and the Lakeshore GO ALRT Project, has been greatly appreciated.

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It is recommended that this report be circulated to the Area Municipalities of Metropolitan Toronto, the Government of Ontario and those Boards, Commissions and Public Corporations affected by transportation and land use matters, for their information.

D I Matton

MAT/gmi

Project Manager

Encl.

III

DOWNTOWN RAPID TRANSIT REPORT NO. 2.03

SUMMARY AND CONCLUSIONS

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SUMMARY

Study Process

The TTC, together with Metro, has undertaken the Downtown Rapid Transit Study to respond to problems associated with peak period crowd conditions on the Yonge Subway line. The mandate of the DRT Study is:

i) To assess the capability of the existing transit system to continue to serve the Central Area of Toronto at a reasonable level of service, and
ii) If required, to recommend improvements in downtown rapid transit over the next twenty years.

Towards this end, the Study has been structured into two parts: Part I dealt with an in-depth analysis of the issues, and identified the transit problems to be faced over the next twenty years. The findings of Part I were summarized in DRT Report 2.01 -Problems and Issues to 2001, May 1984. Part II examined the options available to Metro and the TTC if they wish to maintain the level of transit service that has been enjoyed in Metro during the past three decades. The conclusions of the Part II evaluation are contained in DRT Report 2.02 - Alternative Solutions (Functional Design and Evaluation), March 1985.

Recommendations for a specific alignment are contained in this report, along with a summary of Parts I and II of the Study.

Downtown Office Employment

The single most important factor influencing downtown transportation policies over the next two decades will be the demand for transportation generated by work trips to downtown offices. In a report on employment projections for Metropolitan Toronto, the Research Division of the Metropolitan Toronto Planning Department forecast that office employment, which now provides 39% of all employment in Metro, will increase by almost 190,000 jobs in the twenty year period between 1981 and 2001 and by then represent 47.5% of all employment opportunities in Metro. This will require the construction of an additional 4.8 million square metres of office space in Metro between 1981 and 2001.

Office employment is now the dominant non-residential land use activity in Metropolitan Toronto and much of the recent office growth has occurred along transit routes. The majority share of future office development is also expected to locate along transit routes, and in particular, to concentrate in the sub-centre areas designated in the Official Plan of Metropolitan Toronto.

The proportion of Metro Region office space located in the downtown has fallen from 67% in 1967 to 57% in 1983. The decline in relative growth of downtown is expected to continue. However, over the next twenty years downtown is still expected to capture between 20% and 40% of office development in the Metro Region, compared to 46% over the past fifteen years. Based on Metro Region office employment growth of 190,000, the projected increase in downtown office employment from the year 1981 to 2001 is in the range of 38-76,000.

Office Work Trip Dependency on Transit

During the twelve year period from 1971-1983, more than 90% of all new peak period trips into the downtown have been accommodated by transit; 80% of these by TTC and 20% by GO Rail and Bus Transit. A.M. peak period ridership on the subway increased by 36,800 to 122,400, while TTC surface transit into the downtown actually declined by 1,500 to 18,100. GO Transit ridership grew by 8,800 to 19,400.

Ten years ago the Yonge and University Subways operated with a residual capacity of about 20,000 pph during the peak hour of operation. Approximately one half of this residual capacity has been used to meet the growth in demand in the past decade and, assuming that most additional ridership will choose the University Subway, the remaining residual capacity should meet demand to the mid 1990's under increasingly congested platform conditions and train loadings.

The results of the three forecasting studies indicated reasonably consistent estimates of future transit requirements into downtown for the year 2001. These estimates forecast a 30% to 40% growth in demand for rapid transit trips into downtown on the Yonge-University Subway during the a.m. peak hour in the twenty year period from 1981 to 2001.

The forecasts of increased ridership on the Yonge-University Subway into the downtown indicate that the Level of Service on both lines will be at Level of Service E by the late 1980's, and Level of Service F by the mid 1990's. A Level of Service F operation has never been sustained for any extended period of time on the existing subway, and under these loads the crowd conditions on platforms and on board cars cause extended stops at station platforms. These extended dwell times result in fewer trains getting through the station and an overall reduction in line capacity.

The DRT line recommended in this report is a measure designed to meet future demand and to the greatest extent possible, minimize increases in radial capacity. The line will provide relief to existing and forecast overcrowding into the Central Area without increasing radial transit capacity into the suburban areas of Metro. The line offers the best solution studied that would assure an adequate level of accessibility into the Central Area, while not undermining the achievement of the fundamental objective of the Metro Official Plan to of create a multi-centred urban structure so as to provide a deconcentration of social and economic opportunities and reasonable job alternatives to the Central Area.

The achievement of this objective has been clearly demonstrated by the success of development at Scarborough Town Centre and the North York Centre, and by the reduction of the share of Metro Region office space that has located in the Central Area over the past decade. This reduced share of Metro Region office space locating in the Central Area is expected to continue over the next twenty years, thereby supporting the basic Official Plan objective.

While the multi-centre urban structure concept is a basic tenet of the Official Plan, the Plan also states that, "the Central Area will remain the pre-eminent centre for the Metropolitan Region, serving as the dominant focus of urban activity", (Section 4.B.1). The downtown as the major centre, requires that accessibility to the Central Area be improved in the future in order to satisfy this requirement of the Official Plan.

Recommended Solution

The Downtown Rapid Transit line in its entirety includes a proposed U-shaped rapid transit line from the Danforth Subway serving the Financial District and Exhibition Place to the Bloor Subway, with provision for future extensions to Eglinton Avenue in the vicinity of Don Mills in the east, and Weston Road in the west. In the Metro/TTC Rapid Transit Study of 1982 the conclusion was reached that the portion of the line from Union Station to Danforth Subway was the highest priority, and that other phases of the Downtown Rapid Transit line could be deferred for possible later implementation.

The DRT Study has confirmed that the first stage of construction should be from the Danforth Subway line to the downtown. The western terminus, however, should be at Spadina Avenue rather than Union Station to provide improved integration with existing and proposed surface transit on Spadina Avenue, and to provide improved accessibility to future developments north and south of Front Street to the west of University Avenue.

On the basis of the evaluation of alternatives, the Study recommends the first stage of the Downtown Rapid Transit line be a route along Front Street between Spadina Avenue and Bay Street, continuing east within the railway corridor to the Don River, where the line should then follow an underground alignment along Eastern Avenue and Pape Avenue to connect to the Danforth Subway at Pape Station. The route along Front Street would be underground between Spadina Avenue and Bay Street with downtown stations at Spadina Avenue, the Convention Centre and at Union Station. The proposed DRT station at Union would provide for direct connection to the Subway, to GO Rail, and to the proposed Harbourfront LRT.

An Alternative Position

Implementation of this recommended alignment is subject to satisfactory negotiations for the use of Toronto Terminals Railway right-of-way between approximately Bay Street and the Don River, and the reconstruction of a Hydro Electric Power Commission high voltage power line. Difficulties in acquiring this

right-of-way could impede progress in the implementation of the proposed alignment and an alternative position is recommended. This alternative position involves an alignment through the Central Area along Wellington and Front Streets from Spadina Avenue to the Don River, where the line then becomes common with the recommended route.

The recommended alignment and alternative alignment are shown in Exhibit 7.1 in Section 7.

Implementation

The downtown relief facility recommended in this report will cost an estimated $538 M to $568 M in capital costs (1984 $) depending upon options selected, and will require five years of engineering and construction to complete, following project approval by the Council of Metropolitan Toronto.

The options include the number of stations that may be constructed for local access to the system. The implementation schedule provides for obtaining provincial approvals required under the Ontario Municipal Act and the Environmental Assessment Act; engineering, including selection of vehicle types; and construction, including pre-service testing.

The financial impacts of the program on budgets, taxes and employment generated, together with the implementation schedule, are discussed in more detail in Appendix C of this report.

Technology

The question of technology is not an essential factor in the conclusion of this Study. The Study assumed an ICTS technology to provide a framework for geometric planning and environmental impact evaluation. However with a limited number of changes in geometry a subway technology could be readily adopted.

The only essential question in selecting technology will be the question of line capacity. Ridership studies by the Planning Department of Metro Toronto have

forecast ridership on a new line into the downtown of approximately 16,000 passengers per hour on an average annual basis, and 18,000 passengers per hour on a peak season basis by the year 2001.

These passenger loads dictate a fully grade separated rail transit system, using conventional subway or the Scarborough Rapid Transit type vehicles. The choice of technology, however, is more an operational than a planning matter.

SECTION 1 - INTRODUCTION

Through 1981 the TTC and Metro carried out the (Accelerated) Metro/TTC Rapid Transit Study (ARTS) to consider and review specific transit improvements for possible inclusion in the TTC Capital Works Programme, and to recommend to Metropolitan Council, if necessary, amendments to the Metropolitan Official Plan to accommodate the future expansion of transit facilities within Metropolitan Toronto. The ART Study was initiated, among other things, in response to peak period crowd conditions on the Yonge Subway line and concluded that the Technical Transportation Planning Committee should undertake a feasibility study for a rapid transit 'relief' line from Union Station to the Danforth Subway in the vicinity of the Greenwood Yard, together with a feasibility study of the proposed Waterfront line from Union Station to Exhibition Place, which would include an assessment of options for extending the line north-westerly to the Bloor Subway.

At a meeting on June 16, 1982 the Council of the Municipality of Metropolitan Toronto referred the Metro/TTC Rapid Transit Study Report to the area municipalities for comment. Following receipt of these comments, in June 1983 Metropolitan Council approved among others the following recommendations:

- Recommendation No. 2 of the Metro/TTC Transit Study report dated June 8, 1982, be approved as amended to incorporate the comments of the Borough of Etobicoke:

  'the Technical Transportation Planning Committee be authorized to undertake feasibility studies on the aforementioned two lines (a rapid transit "relief" line from Union Station to the Danforth Subway in the vicinity of the Greenwood yards and an east-west line along Sheppard/Finch from the Yonge Subway to Malvern and the Scarborough Town Centre; the study of the "relief" line to be combined with a feasibility study of the proposed Waterfront line from Union Station to Exhibition Place and its extension north-westerly to the Bloor Subway;'

  that such feasibility studies include an assessment of physical and operational feasibility, alternative rapid transit technologies, environmental

and land use impacts, capital costs, operating costs and revenues, and the implications on transit fares, and that disucssions with the Province of Ontario be held regarding cost sharing arrangements prior to submission of the results of the feasibility studies.

- The Technical Transportation Planning Committee report back as soon as possible with the terms of reference for a feasibility study of the downtown "relief" line, such terms of reference to include the cost of the study and amount to be subsidized by the Province.

- The East York Planning Commissioner's comments in regard to the "relief" line be taken into account during the feasibility study of the downtown "relief" line, and regard be had for the relevant alternatives to such a line, particularly the Bay L.R.T. proposal to provide additional transit capacity south of Bloor Street, and the proposals for reduced headways on the subway and increase in GO capacity to meet the potential long-term need for additional radial transit services.

- The feasibility studies include the cost of making the entire transit system accessible to the disabled.

The TTC, together with Metro, has undertaken the Downtown Rapid Transit Study to recommend improvements in downtown rapid transit over the next twenty years. The Study has been structured into two parts: Part I dealt with an in-depth analysis of the issues, and identified the transit problems to be faced over the next twenty years. The findings of Part I were summarized in DRT Report 2.01 - Problems and Issues to 2001, May 1984. Part II examined the options available to Metro and the TTC if they wish to maintain the level of transit service that has been enjoyed in Metro during the past three decades. The conclusions of the Part II evaluation are contained in DRT Report 2.02 - Alternative Solutions (Functional Design and Evaluation), March 1985.

Recommendations for a specific alignment are contained in this report, along with a summary of Parts I and II of the Study. In addition, the following information relating to implementation of the recommendations is presented:

a) Proposed implementation schedule
b) Impact on TTC five year Capital Works Programme
c) Employment and other benefits resulting from construction of the recommended line

SECTION 2 - PROJECTION OF FUTURE EMPLOYMENT AND TRAVEL DEMAND

Downtown Office Employment

The single most important factor influencing downtown transportation policies over the next two decades will be the demand for transportation generated by work trips to downtown offices. In a report on employment projections for Metropolitan Toronto, the Research Division of the Metropolitan Toronto Planning Department forecast that office employment, which now provides 39% of all employment in Metro, will increase by almost 190,000 jobs in the twenty year period between 1981 and 2001 and by then represent 47.5% of all employment opportunities in Metro. This will require the construction of an additional 4.8 million square metres of office space in Metro between 1981 and 2001.

Office employment is now the dominant non-residential land use activity in Metropolitan Toronto and much of the recent office growth has occurred along transit routes. The majority share of future office development is also expected to locate along transit routes, and in particular, to concentrate in the sub-centre areas designated in the Official Plan of Metropolitan Toronto. In view of the important role office related work trips have on major decisions regarding future transit, three separate methods were used to forecast transit demand into the downtown through to the year 2001. The methods used included a trend analysis, a demographic analysis, and transportation modelling.

The trend analysis consisted of a review of historical ridership and development trends and a projection of those trends into the future. The demographic forecasting involved a forecast of population and labour force for the Metropolitan Toronto Region and an estimate of the percentage of the labour force that will work in downtown offices. Finally, the third method used to develop the forecast for demand through to the year 2001, involved the application of a computerized travel demand model.

In the demographic forecast of downtown office employment, consideration was given to anticipated changes in the structure of the Canadian economy and in the

impact of deconcentration policies on locational decisions by potential downtown office employers. In estimating the growth in downtown office employment between 1981 and 2001, Woods Gordon, a consultant to the study, drew the following conclusions:

1. The employment level in the Metro Region is expected to grow by 23%.

2. Office employment in the Metro Region is expected to grow by 32%. This faster growth rate in office employment reflects changes in the employment structure.

3. The proportion of Metro Region office space located in the downtown has fallen from 67% in 1967 to 57% in 1983. The decline in relative growth of downtown is expected to continue. Over the next twenty years downtown is expected to capture between 20% and 40% of office development in the Metro Region, compared to 46% over the past fifteen years.

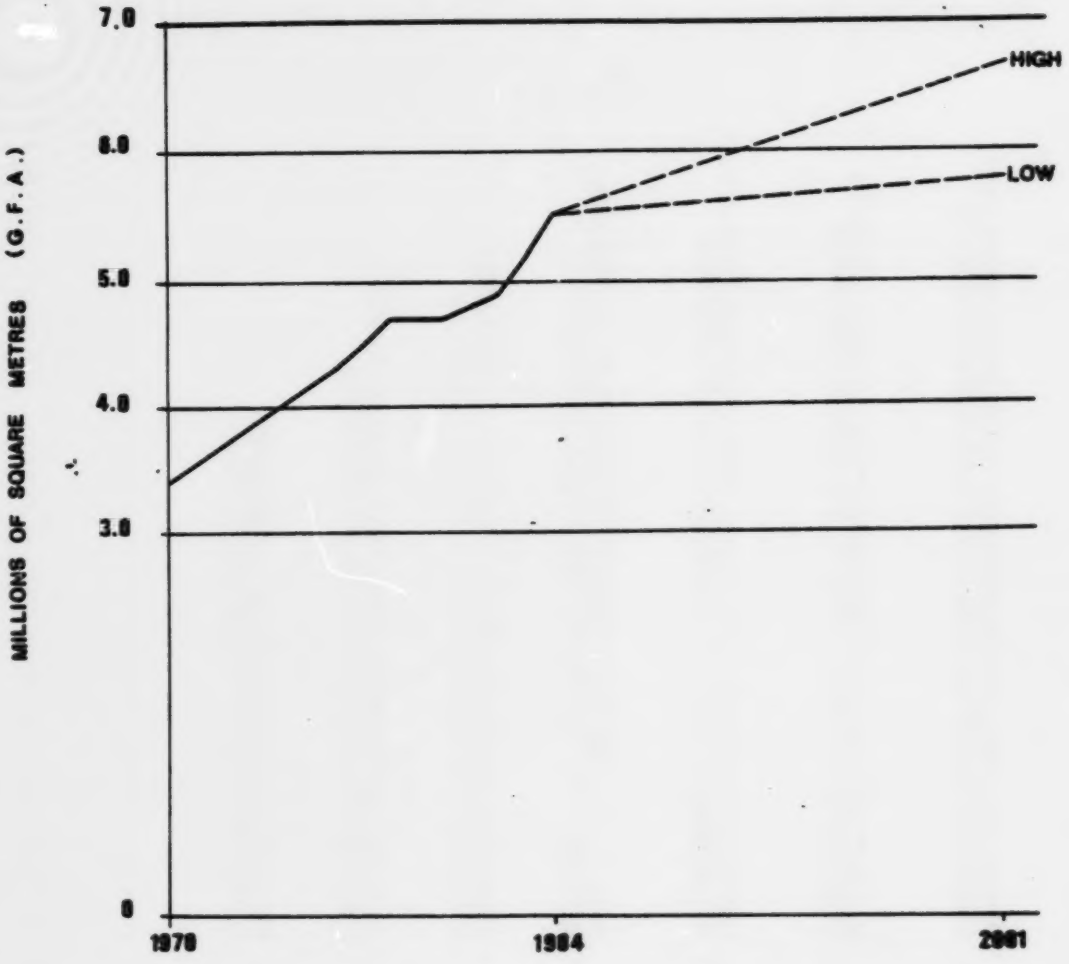
Based on Metro Region office employment growth of 190,000, the projected increase in downtown office employment from the year 1981 to 2001 is in the range of 38-76,000. This growth in office employment has been reflected in the growth of downtown office space shown on Exhibit 2.1. This exhibit records actual growth of office space in the Central Core over the past fifteen years and forecast growth over the next twenty years.

Office Work Trip Dependency on Transit

During the twelve year period from 1971-1983, more than 90% of additional peak period trips into the downtown have been accommodated by transit; 80% of these by TTC and 20% by GO Rail and Bus Transit. A.M. peak period ridership on the subway increased by 36,800 to 122,400, while TTC surface transit into the downtown actually declined by 1,500 to 18,100. GO Transit ridership grew by 8,800 to 19,400.

The historical relationship in the downtown between peak period subway station usage and downtown occupied office space is illustrated in Exhibit 2.2. This exhibit demonstrates a direct relationship over the past fifteen years between increasing total occupied office space in the Central Area and increasing subway usage during the peak travel period. This relationship is expected to continue or become even more pronounced in the future as congested roads make existing and future downtown employees more dependent upon transit as a means of travel to and from work.

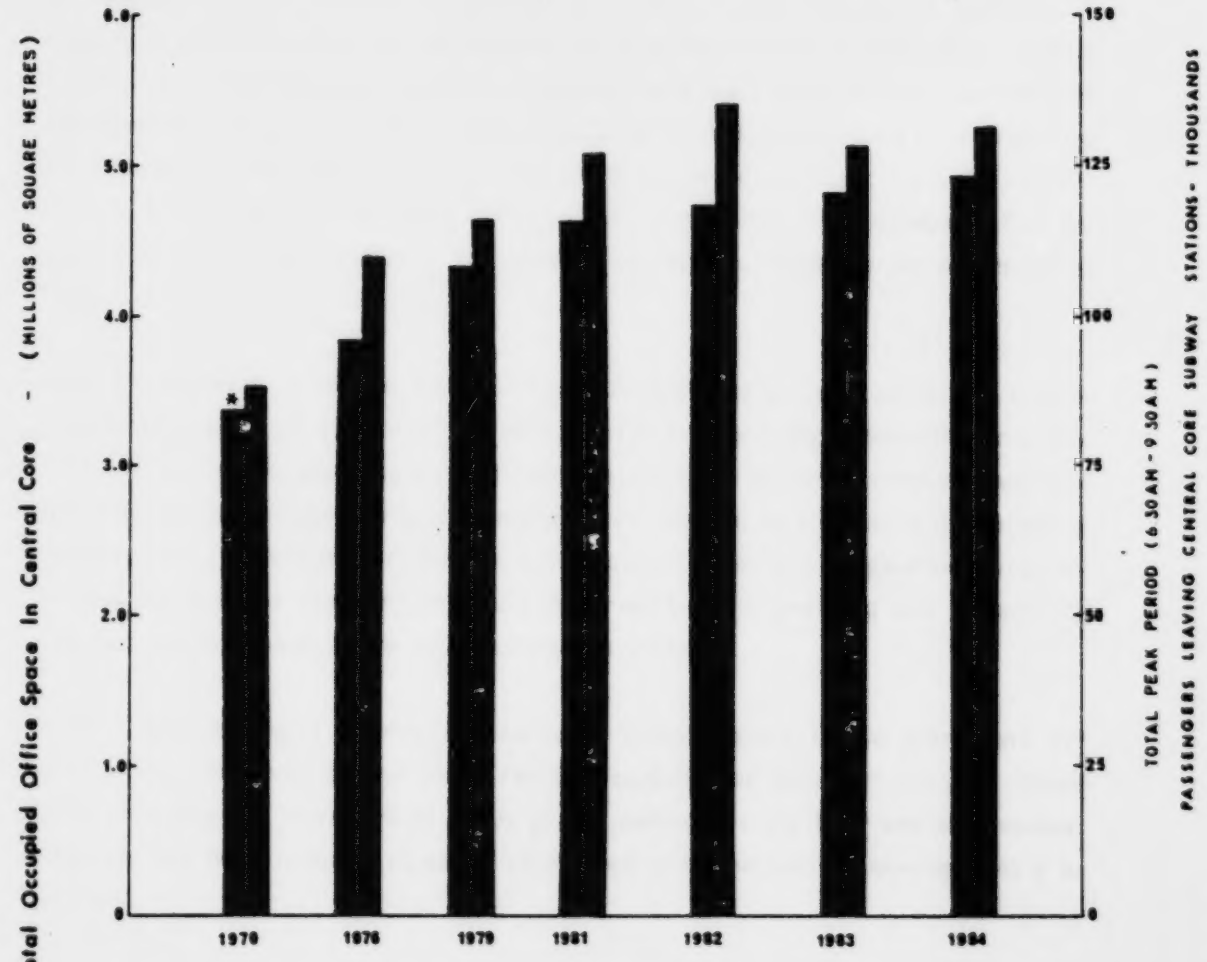
EXHIBIT 2.1



PAST AND PROJECTED GROWTH
IN CENTRAL CORE OFFICE SPACE

EXHIBIT 2.1

EXHIBIT 5'1



HISTORICAL RELATIONSHIP OF CENTRAL CORE OFFICE SPACE VS SUBWAY STATION USAGE

EXHIBIT 2.2

EXHIBIT S.2

SECTION 3 - EXISTING SUBWAY CAPACITY

The TTC establishes maximum service loading standards for all operating transit vehicles. These loading standards are one of a number of criteria used by the TTC in establishing the service frequency on transit routes throughout Metro. A maximum service load of 225 passengers has been established by TTC for a 75 foot subway car. This loading standard, combined with field observations, was used in the development of Level of Service standards for the measurement of crowding conditions on trains and platforms. The Level of Service concept was used in DRT Report 2.01 to compare demand with the ability of the Yonge-University Subway system to meet that demand. These Level of Service standards are presented in Exhibit 3.1.

Over the past ten years, the Yonge Subway has operated at Level of Service E with a train frequency of 28 trains per hour. Delays in passenger boarding and off-boarding at the Yonge-Bloor interchange station have become common place and preclude the opportunity for more frequent train service as a measure for relieving overcrowding. Because of the extended dwell times at Yonge-Bloor Station, putting more trains into service would only result in further stop and go activity experienced by subway trains approaching this station.

In 1974 the University Subway was carrying approximately 15,000 passengers per hour in the peak period, and had a residual capacity of about 19,000 pph. Since 1974, ridership has increased to about 24,000 passengers per hour and the residual capacity has been reduced to about 10,000 pph with the service now operating at Level C.

Forecasts of increased ridership on the Yonge-University Subway into the downtown indicates that the Level of Service on both lines will be at Level E by the late 1980's, and Level F by the mid 1990's. At this Level of Service, delays, stoppage in tunnels, and service breakdowns are expected to occur on a regular basis on both subway lines, and transfer capacity at both St. George and Yonge-Bloor Stations will become critical.

EXHIBIT 3.1

YONGE-UNIVERSITY SUBWAY
LEVEL OF SERVICE

Level of Service	Description	Volume to Service Load Ratio	Car Loading	6 Car[1] Train Loading	Line[2] Capacity
A	Choice Seating Zone. No standees.	0- .25	0- 56	0- 319	0- 9,000
B	Seating Zone. Some Standees. Relative ease of movement within car.	.25- .50	56-112	319- 638	9,000-18,000
C	Standee Zone I. Almost all seats used. One standee for each seated passenger. Limited movement within car.	.50- .75	112-169	638- 963	18,000-27,000
D	Standee Zone II. No seating available. Three standees for every two seated passengers. Circulation within car difficult.	.75- .85	169-191	963-1,089	27,000-31,000
E	Contact Zone. Extremely crowded. Some passengers left on platform.	.85- .95	191-214	1,089-1,220	31,000-34,000
F	Close Contact Zone. Maximum service load. Passengers regularly left on platform. Movement within car only possible enmasse. System delays and stoppages start to occur	.95-1.00+	214-225[3]	1,220-1,283	34,000-36,000+

1. The 6 car train loading is calculated as 95% of the total of individual car loadings to allow for uneven distribution of passengers.
2. Calculated on the basis of 28 trains per hour.
3. A passenger load of 225 pph on each of the six cars in a train set operating on a schedule of twenty-eight trains per hour produces a theoretical capacity for the line of 37,800 pph.

SECTION 4 - ALTERNATIVES TO RAPID TRANSIT

The Surface Transit Options

Existing surface transit into downtown consists of four streetcar lines and three bus and one trolley line. The four streetcar services operating on King, Queen, Dundas and Carlton carry a total of about 7,500 passengers in the peak hour of travel into downtown. The bus and trolley services operating on Church, Bay, Avenue Road and Spadina carry about 5,000 passengers into downtown during the peak hour.

These surface routes either serve local residential population in the general area south of Bloor-Danforth between High Park and the Beaches, or they serve as local distributors to employment areas immediately south of the Bloor-Danforth Subway. The Queen streetcar is a typical service to residents of the City of Toronto. The Bay trolley on the other hand, primarily operates as a distributor serving work trips to work locations between Bloor and Queen. Demand for service on these downtown surface routes is highly dependent upon the resident population. Over the past decade the City residential population and resident labour force have been declining, and so too has the ridership on the downtown surface transit routes.

While these existing surface transit routes have not successfully attracted ridership from the subway system; a number of alternatives involving new more direct surface transit, have been proposed. These proposals include systems such as light rail transit similar to what is now operating on the Queensway between Roncesvalles and the Humber Loop, or express bus services on exclusive transit lanes, similar to the operation on the Allen Road Extension or Eglinton Avenue.

Both operations require transit priorities that permit the transit vehicles to bypass traffic congestion on the streets. These transit priorities may include restrictions on left turns, restrictions on access to private property, and restricting the amount of traffic permitted across the transit route. Both surface transit options presuppose that existing right-of-way can be transferred from existing use, usually local traffic and parking lanes, to exclusive transit usage during the peak period.

This proposal to transfer road surface or right-of-way to exclusive transit usage in the downtown is only practical where a sufficient right-of-way exists or can be secured. Specifically, an LRT line with exclusive right-of-way is a practical consideration on Spadina Avenue, but not practical on a narrow street such as Parliament.

A summary of the evaluation of surface transit options is presented in Exhibit 4.1. The relief that can be provided through surface transit improvements is limited. With pro-transit priority measures including exclusive right-of-way and turn restrictions during peak periods of travel, the express bus services on Don Mills and Sherbourne have a theoretical potential to offer relief equivalent of three to five years of projected growth. On a practical basis, however, there are some serious road blocks to ever achieving these theoretical results.

The successful diversion of downtown destined trips from the subway to a bus service operating on Sherbourne is uncertain at best, and would require major priority measures to have any reasonable chance of succeeding. These measures should include exclusive lanes for the bus service and restriction on turns that would interfere with the free flow of the bus service. This level of transit priority traffic operation is not considered practical on Sherbourne and without it, a Sherbourne express bus service cannot be expected to achieve much in the way of relieving passenger congestion on the Yonge Subway and at the Yonge-Bloor Station.

The Don Mills express bus has the potential to offer improved transit service to residents in the Don Valley corridor, but has a limited potential for off-loading the subway and reducing transfer traffic at Yonge-Bloor. TTC studies of the proposed Don Mills express service have further indicated that it would be a very high cost transit service to operate.

The conclusions drawn from these studies are that compared to the passenger volumes travelling into the downtown by subway, these surface transit improvements can have very little impact. At best, surface transit improvements can help ease the crowding and bridge the gap until new rapid transit can be built into downtown.

EXHIBIT 4.1

SURFACE TRANSIT OPTIONS - SUMMARY

Proposal	Status	Discussion	Potential Relief Capacity pph	
			University Subway	Yonge Subway
Parliament LRT	Proposed by TTC Staff	o Negative impact on existing street uses o Exclusive right-of-way not considered available	--	--
Spadina LRT	Proposed by TTC Staff	o Wide street allowance should provide an available right-ofway o Implementation is dependent upon construction of Spadina Avenue bridge south of Front o Moderately negative impact on existing street uses o Provides potential relief to future overcrowding at St. George Station and on University Subway o Too far west to provide relief to Yonge Subway and Yonge-Bloor Station	5,000	--
Sherbourne Express Bus	Proposed by TTC Staff	o Negative impact on existing street uses o Negotiations for exclusive right-of-way during peak periods are uncertain	--	3,600[1]
Don Mills Express Bus	Proposed in Don Valley Transportation Corridor Study	o Articulated bus operation on three minute headway[2] o Minimal negative impact on other street uses o Feasibility Study conducted by TTC concluded operating costs would be very high. Option therefore rejected.	--	1,700

1. From Metro/TTC Rapid Transit Study Report No. 5
2. From Don Valley Corridor Transportation Study

GO Transit Options

GO Transit rail service into downtown Toronto now consists of a total of 25 trains entering Union Station in the peak morning period between 7:00 a.m. and 9:00 a.m., operating on seven different radial lines. Four of these lines serve west and north-west commuter trips, while the remaining three lines serve east and north-east commuters. These services are provided using both single-level and bi-level cars in train lengths that vary up to ten cars. A similar peak period service is offered in the 4:00 p.m. to 6:00 p.m. peak travel period in the evening. Reduced services are offered at other times between approximately 6:00 a.m. and 12:00 p.m.

In 1983 Lakeshore GO Rail service carried 10,796,000 passengers of which 87% were work trips with 97% of these trips destined to the core area of Toronto through Union Station.

GO Rail serves the almost exclusive purpose of meeting the transit needs of residents who live either outside Metro Toronto or in the outer suburbs of Metro, and who work downtown.

Over the next two decades growth in office employment will be due to both structural changes in the economy, and growth in the labour force. Most downtown office employment generated by structural changes will be drawn from residents inside Metro and will increase demand on the TTC subway and surface system. Most of the growth in the labour force will occur outside Metro, and correspondingly will increase demand for service on GO Rail, GO Bus, Mississauga Transit and Markham Transit. The growth in (peak point) ridership on GO Rail by the year 2001 is expected to increase to 32,000 passengers per hour during the peak a.m. period. This will require ten minute service on both the Lakeshore East and Lakeshore West, and increased service on the Richmond Hill and Milton lines.

Although expansion of existing GO Rail services will be required to meet the growing demands for service into the downtown from municipalities outside Metro, such expansion will not meet the relief requirements associated with the Yonge-University Subway. This is supported by the travel demand analysis prepared for in the DRT Problems and Issues report. That analysis concluded that 40% of forecast

increases in transit travel demand to the downtown would be carried by GO Transit, 5% by surface transit 55% by the Yonge-University Subway system, with a resulting overloading of the Yonge-University Subway system by the early to mid 1990's. The 40% GO Transit share was based on the demographic forecasting method, which recognizes that the majority of the growth in the Metro Region population over the next twenty years will occur outside of Metro.

SECTION 5 - RAPID TRANSIT NEEDS TO THE YEAR 2001

Since 1974 the Yonge Subway has been operating at Level of Service E and at times during three years (1974, 1975 and 1981) operated at Level F. Peak period loading on the Yonge Subway in 1974 and 1975 reached approximately 34,500 and then declined with the 1978 opening of the Spadina Subway.

From 1978 to 1981 ridership again grew on the Yonge Subway reaching approximately 35,000 pph in 1981. Since 1981 the decline in the economy has led to a corresponding decline in peak period ridership into the downtown and service is now again operating at Level of Service E.

In 1974 the University Subway was carrying approximately 15,000 passengers per hour in the peak period, and providing service at Level B. Since 1974 ridership has increased to about 24,000 passengers per hour and the service is now at Level C.

The results of the three forecasting studies discussed in Section 2 indicated reasonably consistent estimates of future transit requirements into downtown for the year 2001. These estimates, which are presented in Exhibit 5.1, forecast a 30% to 40% growth in demand for rapid transit trips into downtown on the Yonge-University Subway during the a.m. peak hour in the twenty year period from 1981 to 2001.

These forecasts of increased ridership on the Yonge-University Subway into the downtown indicate that the Level of Service on both lines will be at Level of Service E by the late 1980's, and Level of Service F by the mid 1990's. A Level of Service F operation has never been sustained for any extended period of time on the existing subway, and under these loads the crowd conditions on platforms and on board cars cause extended stops at station platforms. These extended dwell times result in fewer trains getting through the station and an overall reduction in line capacity.

EXHIBIT 5.1

SUMMARY OF RESULTS OF THREE METHODS FOR ESTIMATING TRANSIT DEMAND ON YONGE-UNIVERSITY SUBWAY FOR THE YEAR 2001

A.M.Peak Hour

	HIGH		LOW	
Trend Analysis	76,000		70,000	
Demographic Forecast	79,575	(40% Share)	69,375	(20% Share)
Travel Demand Model[1]	72,725		72,725	
AVERAGE	76,000		71,000	

Source:

Exhibit 3.25, DRT Report 2.01 - Problems and Issues to 2001, May 1984

1 Output from Travel Demand Model factored up by 15% to account for maximum demand conditions during peak season loadings.

It is important at this point to note that these ridership forecasts for the Yonge-University Subway have been built upon four key assumptions:

1. Whereas approximately 50% of Metro Region office development over the past twenty years has located in the downtown; it is assumed that only 20% to 40% will chose a downtown location over the next twenty years. Whether individual development proposals such as the Railway Lands proceed or do not proceed is not expected to affect this overall share of the office market.

2. The GO Transit share of transit trips into downtown will increase. Whereas GO Transit carried 20% of the growth in transit trips into downtown over the past twelve years; it is assumed that this will double to 40% of all additional transit trips over the next twenty years. This assumption reflects an expected predominant growth in residential population outside Metropolitan Toronto.

3. Variable work programs will be effective in reducing the peaking of peak period ridership. Approximately 62% of today's a.m. subway work trips are made in the peak hour, and the forecasts of ridership assume that continued promotional programs will be effective in reducing this peaking factor.

4. Growth in ridership into the downtown will be diverted to the University Subway until loads are balanced on the Yonge and University Subways.

The next decade is expected to be a time of transition with many structural changes in employment in the Metro Region. These changes are expected to result in an increased proportion of office employment throughout the Metro Region, and despite a declining growth rate in the overall labour force, a strong job market in office employment is expected to continue.

While more of this office employment is expected to locate outside the downtown, a strong growth in downtown office employment is forecast to continue. The existing vacant downtown office space, and space presently under construction, is a visible indication of the potential for employment growth in downtown offices.

This space alone could add 35,000 new employees downtown, with a corresponding increase of 10,000 new peak hour riders on the subway. The forecast growth in demand on the Yonge and University Subways is shown on Exhibit 5.2. This exhibit reflects the assumptions of slower growth in the downtown and greater usage of GO Transit, and has been graphed to reflect the average findings of the three separate forecasting techniques used.

Ten years ago the Yonge and University Subways operated with a residual capacity of about 20,000 pph during the peak hour of operation. Approximately one half of this residual capacity has been used to meet the growth in demand in the past decade and, assuming that most additional ridership will choose the University Subway, the remaining residual capacity should meet demand to the mid 1990's under increasingly congested platform conditions and train loadings.

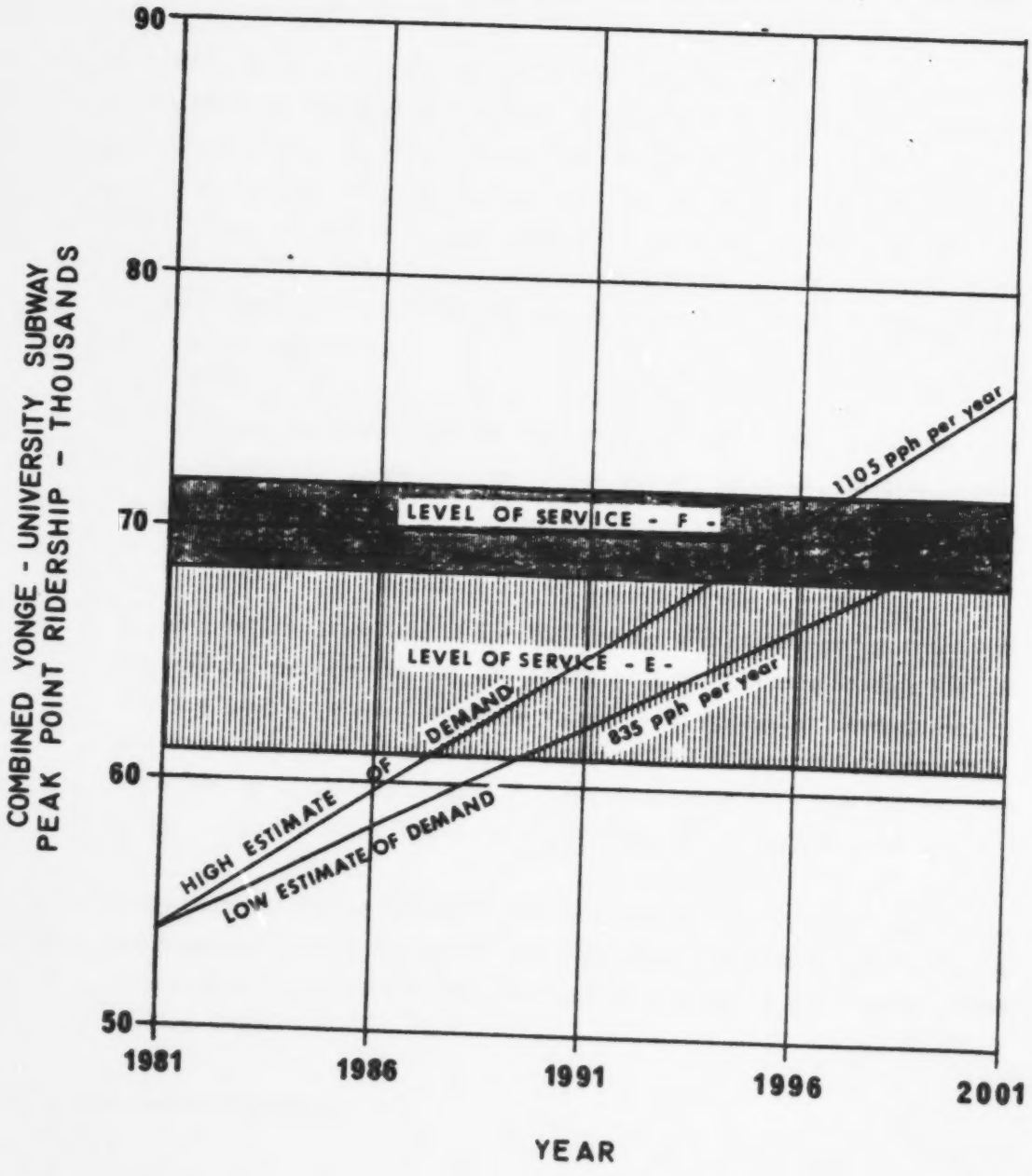
The DRT line recommended in this report is a measure designed to meet future demand and to the greatest extent possible, minimize adding radial capacity. The line will provide relief to existing and forecast overcrowding into the Central Area without increasing radial transit capacity into the suburban areas of Metro. The line offers the best solution studied that would assure an adequate level of accessibility into the Central Area, while not undermining the achievement of the fundamental objective of the Metro Official Plan to create a multi-centred urban structure so as to provide a deconcentration of social and economic opportunities and reasonable job alternatives to the Central Area.

The achievement of this objective has been clearly demonstrated by the success of development at Scarborough Town Centre and the North York Centre, and by the reduction of the share of Metro Region office space that has located in the Central Area over the past decade. This reduced share of Metro Region office space locating in the Central Area is expected to continue over the next twenty years, thereby supporting the basic Official Plan objective.

While the multi-centre urban structure concept is a basic tenet of the Official Plan, the Plan also states that, "the Central Area will remain the preeminent centre for the Metropolitan Region, serving as the dominant focus of urban activity", (Section 4.B.1). The downtown as the major centre, requires that accessibility to the Central Area be improved in the future in order to satisfy this requirement of the Official Plan.

FORECAST INCREASE IN DEMAND FOR
RAPID TRANSIT SERVICE INTO DOWNTOWN

EXHIBIT 5.2



FORECAST GROWTH IN DEMAND FOR RAPID TRANSIT SERVICE INTO DOWNTOWN

EXHIBIT 5.2

SECTION 6 - ALTERNATIVES EVALUATION

The Downtown Rapid Transit line in its entirety includes a proposed U-shaped rapid transit line from the Danforth Subway serving the Financial District and Exhibition Place to the Bloor Subway, with provision for future extensions to Eglinton Avenue in the vicinity of Don Mills in the east, and Weston Road in the west. In the Metro/TTC Rapid Transit Study of 1982 the conclusion was reached that the portion of the line from Union Station to Danforth Subway was the highest priority, and that other phases of the Downtown Rapid Transit line could be deferred for possible later implementation.

The DRT Study has confirmed that the first stage of construction should be from the Danforth Subway line to the downtown. The western terminus, however, should be at Spadina Avenue rather than Union Station. The reasons behind this recommendation are:

1. A continuation of the line to Spadina Avenue will improve integration with the surface transit system by connecting with the proposed Spadina LRT or existing Spadina Avenue transit services. With continuing development of the Waterfront, a Spadina and Harbourfront LRT is expected to become an important downtown distributor, which will be more effective if connected to the Downtown Rapid Transit line at both Spadina Avenue and Bay Street.

2. A continuation of the line to Spadina Avenue will improve accessibility to the proposed Spadina Subcentre of the Railway Lands Development, to the Convention Centre, to the CBC development site, and to the proposed Dome Stadium site.

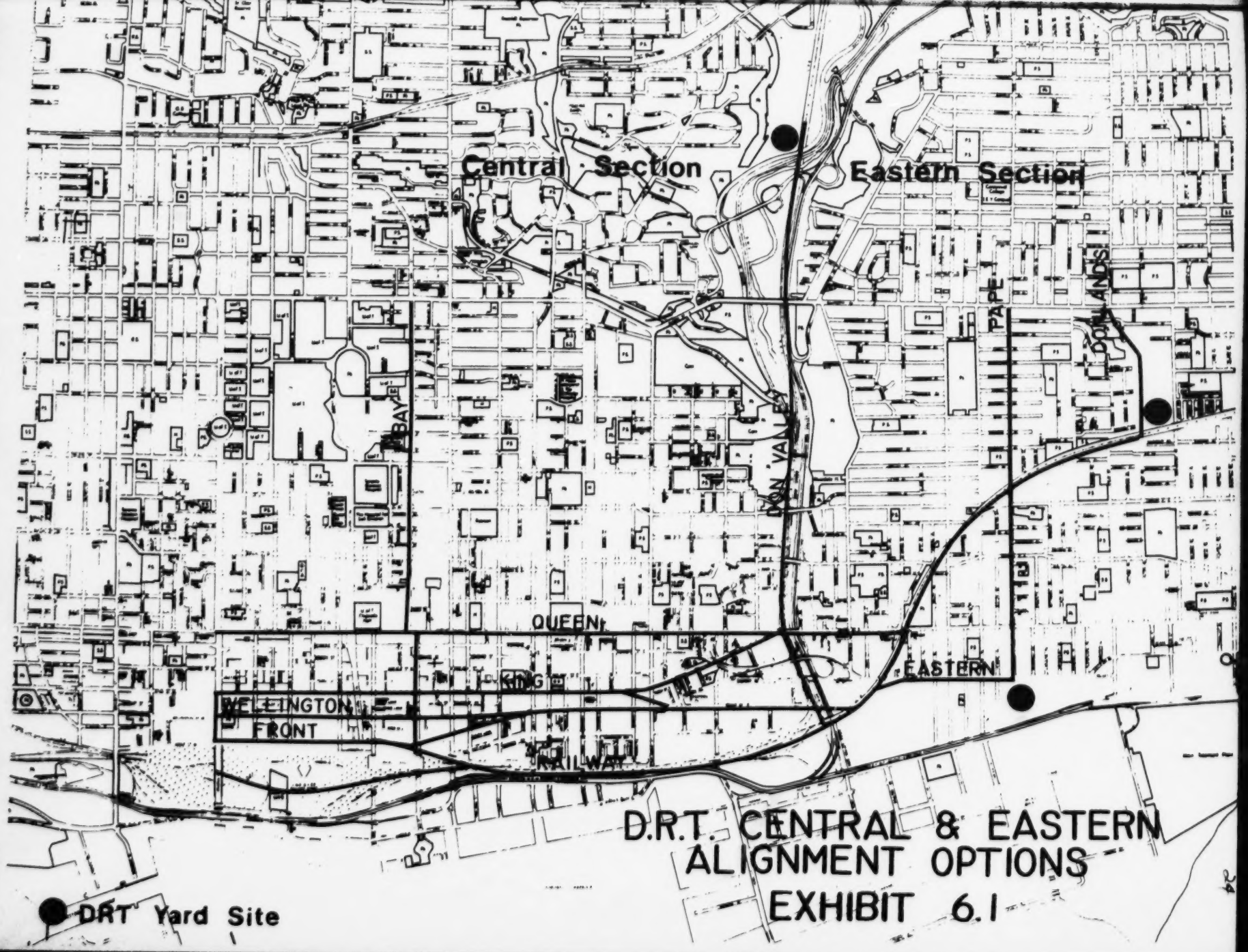
The Alternative Alignments

The alternative alignments considered in the DRT Study for the first stage of construction are shown in Exhibit 6.1. Six different Central Section (Spadina to Don River) routes have been evaluated in the Study for rapid transit service into the Central Core. The alternatives tested include consideration of rapid transit service on five east-west routes, Queen, King, Wellington, Front and the Railway

Corridor, and north-south (underground) light rail transit service on Bay Street. The east-west alignments are located to form the downtown section of a U-shaped rapid transit line connecting the Danforth Subway to the Bloor Subway via the downtown. The Bay Street LRT alignment could operate as a continuous north-south system with the proposed Harbourfront LRT service.

Exhibit 6.1 also shows the three alternative Eastern Section routes evaluated in the Study for connecting the Downtown Rapid Transit line to the Danforth Subway. The Study considered making a possible connection at three different subway stations on the Danforth for transfer traffic between the Subway and the Downtown Rapid Transit line, and examined routes for the alternative connecting points. The alignments included a route in the Don Valley with a transfer station at Broadview Station; a route on Pape Avenue with a transfer station at Pape; and a route following the CN Railway Corridor to the TTC Greenwood maintenance yards, and then north to the Danforth with a transfer station at Donlands Station.

The planning for a Downtown Rapid Transit alignment is constrained by the need to establish a location for yards for servicing and maintenace of the trains operating on the line. The Study identified three possible sites shown on Exhibit 6.1 associated with the three alternative Eastern Section alignments.



D.R.T. CENTRAL & EASTERN
ALIGNMENT OPTIONS
EXHIBIT 6.1

Evaluation Procedures

A detailed evaluation of the alternative alignments is presented in DRT Report 2.02 - Alternative Solutions. That evaluation tested the options under five areas of general criteria and is summarized in Appendix A of this report. These evaluation criteria included:

1. Transit Service
   - Effectiveness in reducing transfer traffic at Yonge-Bloor and St. George Stations
   - Effectiveness in reducing passenger loads on the Yonge, University and Bloor-Danforth Subways
   - Integration with existing and planned transit facilities both downtown and in the Danforth area
   - Accessibility to existing and proposed downtown office space

2. Policy Consideration
   - Consistency with policies of Metro Toronto, the City of Toronto, the Borough of East York and the Toronto Transit Commission

3. Economic
   - Capital and operating costs

4. Environmental Impacts
   - Effects on the natural environment
   - Community, housing and development pressures

5. Implementation
   - Right-of-way availability
   - Public nuisance during construction
   - General construction difficulties.

Central Section

QUEEN AND RAILWAY

The Queen and Railway alignment alternatives are not considered to provide sufficient transit service in terms of serving the combination of existing and forecast trips destined to the Financial District and emerging development areas adjacent to the Central Core. The reasons for this are discussed below.

Although the Queen alignment would achieve a reasonable level of diversion in terms of attracting existing (1984) subway riders from the Danforth, Yonge and University Subway lines, it is too far north to effectively serve the majority of future trips to new development in the existing Financial District and does not at all serve the proposed Railway Lands Development. Only 0.3 m.s.m. of new development is either actively proposed or has been identified within 300 metres of the Queen alignment, compared to 1.8 m.s.m. for the Front Street and Railway alignments and 1.3 m.s.m. for the Wellington and King Streets alignments.

The Railway alignment is basically too far south to effectively serve existing Central Core office employment, which is primarily concentrated in the Financial District north of Front Street. A Railway alignment basically would serve only proposed development within and along the fringes of the Railway Lands, and little else. Although service to the Railway Lands is desirable, a DRT line along King, Wellington or Front would provide superior service to the combination of both the Railway Lands and existing employment centres and, as a result, would provide more effective relief to the Yonge-University line than would the Railway Lands alignment.

BAY LRT

On a practical basis, the Bay alignment is limited to a form of Light Rail Transit technology using vehicles that can enter and leave service by way of the existing surface streetcar network.

The possibility of using subway cars by connecting the Bay line to the existing subway for access to yard facilities was considered in the Study. At the south

end of the line, the Yonge-University Subway is constructed with minimum radius operating curves and therefore, it is impossible to develop a track alignment that would connect either the Yonge or the University tracks to a line on Bay Street. At the north end, the problems of connecting to the Bloor-Danforth Subway are equally difficult. From Spadina Station to Yonge-Bloor Station the existing subway track consists of ramps, cross-overs, and switches required for the wye connection between the Bloor-Danforth and the University Subways. The only possible connection between a subway on Bay and the Bloor Danforth would be between Yonge-Bloor Station and Sherbourne Station.

A second alternative for employing subway technology on Bay involved developing a yard dedicated specifically to the Bay Subway. This would require a site of four to six hectares within the Central Area along the Bay Street corridor for car storage and maintenance. The Study concluded that there was no practical yard site available in this corridor for this purpose.

The adoption of a Light Rail Transit technology on Bay Street assumed the use of articulated streetcars operating on a line that would be integrated with the proposed Harbourfront LRT. The length and frequency of trains on the line would be restricted to what is acceptable for the surface operation along Queen's Quay. In this report it has been assumed that two car trains (50 metres in length) operating at a frequency of two minutes in each direction was the maximum practical density of transit vehicles for a surface system crossing streets at-grade. This limits the capacity of the LRT line on Bay Street to 8,100 passengers per hour compared to an existing surface transit capacity on Bay Street of 2,160 passenger per hour. This would result in a capacity increase of only 5,940 pph.

While a Bay LRT line may meet the most immediate and most apparent transit capacity problems into the downtown, the relief would be short lived. Investment in a Bay LRT would provide some relief from overcrowding on the Yonge Subway and at Yonge-Bloor Station but would be soon followed by renewed concerns over capacity problems on the Bloor-Danforth Subway and renewed demands for relief to overcrowding of the east-west Bloor-Danforth Subway.

The Bay LRT proposal would therefore fail to make a significant contribution to the long term needs for subway relief into the Central Area, compared to an east leg of the DRT which can offer capacity relief into the Central Area for both the Yonge-University line south of Bloor, and the Bloor-Danforth line east of Yonge. On a long term basis the DRT east leg would still leave the Bloor line west of St. George in need of relief facilities, which could be provided by either an Eglinton West Rapid Transit line, a west leg of the DRT line, or the proposed Spadina LRT.

KING, WELLINGTON AND FRONT ALIGNMENTS

The King, Wellington and Front Street alignments all would provide significant improvement in access to the Financial District and were evaluated in more detail in terms of service to proposed new developments, connections to other transit services, and their ability to reinforce development policies within the downtown.

The evaluation for the Central and Eastern Section alternative alignments is summarized in Appendix A of this report.

SECTION 7 - RECOMMENDED SOLUTION

The Recommended Alignment

On the basis of the evaluation of alternatives, the Study recommends the first stage of the Downtown Rapid Transit line be a route along Front Street between Spadina Avenue and Bay Street, continuing east within the railway corridor to the Don River, where the line should then follow an underground alignment along Eastern Avenue and Pape Avenue to connect to the Danforth Subway at Pape Station. The route along Front Street would be underground between Spadina Avenue and Bay Street with downtown stations at Spadina Avenue, the Convention Centre and at Union Station. The proposed DRT station at Union would provide for direct connection to the Subway, to GO Rail, and to the proposed Harbourfront LRT. The reasons behind this recommendation are:

1. Existing construction and development proposals for the downtown clearly show a trend towards a southerly extension of the Financial District, with Front Street at or near the centre of gravity of this new development activity.

2. This trend towards the south is strongly supported by planning policies of the City of Toronto, and a Front Street alignment with stations at Spadina Avenue, Convention Centre and Union will reinforce these policies.

3. Development in the northerly section of the Financial District is already well served by rapid transit stations located on the Yonge and University Subways, and will continue to be well served, provided sufficient diversion can be achieved to ensure a satisfactory level of service on the existing subway. The Front Street alignment will further improve service to these developments as far north as King Street, which would be within comfortable walking distance of any stations located along Front Street.

4. The Front Street alignment provides an opportunity for a station at Union, which would act as a hub for connecting transfers between different transit facilities (the Subway, GO Rail, Harbourfront LRT, DRT). The combination

of traffic growth at Union Station due to the increasing number of work destinations in the area and increased transfer traffic, will require expansion of the subway station and pedestrian facilities at Union. These expansion requirements are presented in Appendix B of this report, which shows that a three platform layout at Union Subway Station is feasible. Operational details for such a configuration would later need to be addressed.

5. The Railway Corridor alignment between Bay Street and the Don River offers a potential opportunity for lower cost construction by building the line at-grade in the Toronto Terminals Railway corridor along the north side of the Gardiner Expressway.

6. The Pape-Eastern route will serve an established high volume bus corridor north of the Danforth operating on reserved lanes, and provide bus passengers at Pape with an opportunity to transfer directly onto the downtown relief line.

7. The Pape-Eastern route is consistent with planning policies of the Borough of East York and reinforces these policies towards more intensive development within the Pape corridor north of Danforth Avenue.

8. The Pape-Eastern route provides access to a potential yard site on Eastern Avenue, the acquisition of which would permit release of TTC interest in the Kipling-Dundas subway yard site.

9. The Pape-Eastern route has the least impact on the natural environment and residential properties. The Don Valley option would significantly effect the natural environment of the Valley, and the railway option east of the Don River requires the acquisition of a strip of private property along the south-east edge of the railway to meet the right-of-way requirements of both railway and DRT.

An Alternative Position

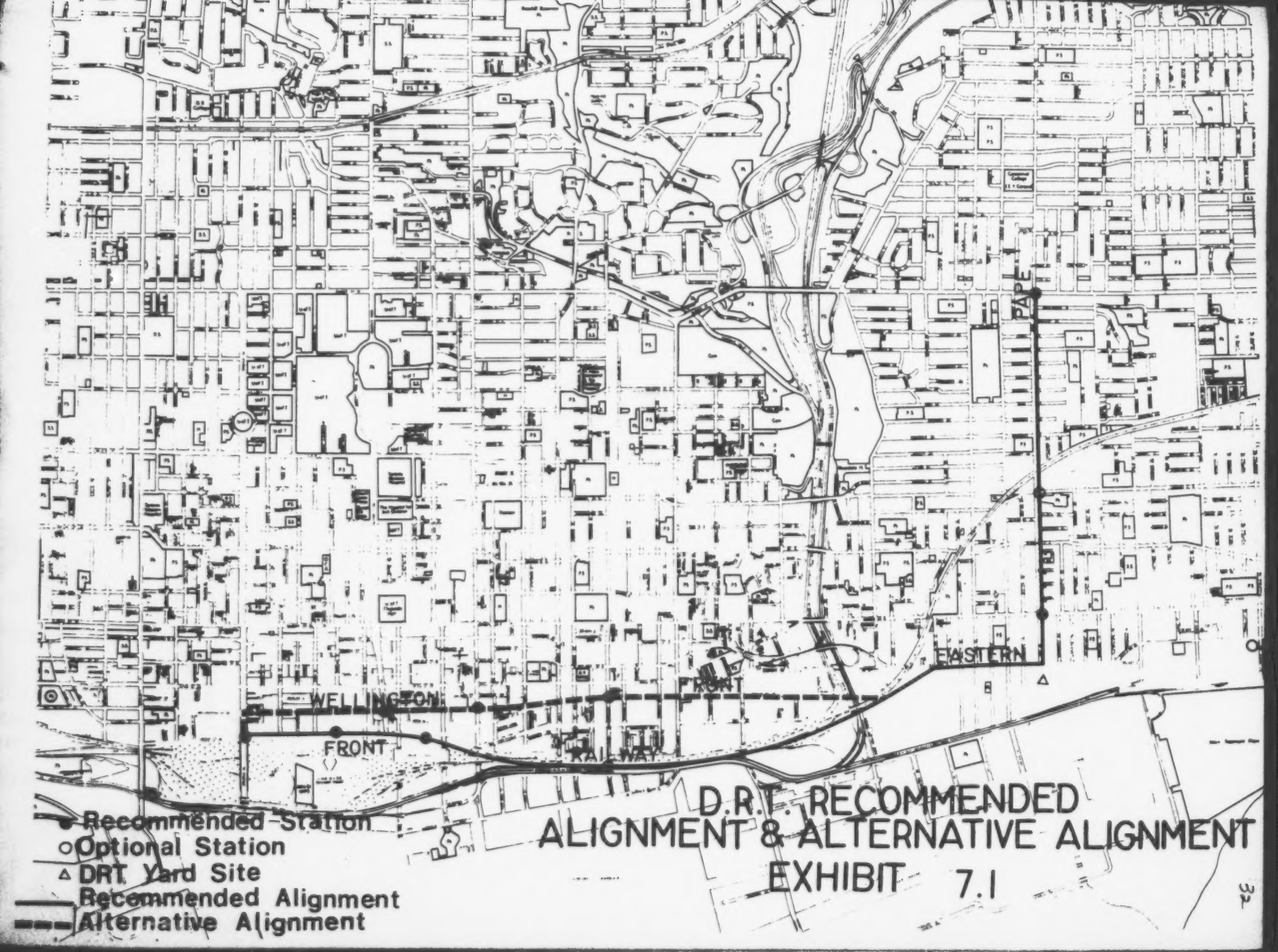
Implementation of this recommended alignment is subject to satisfactory negotiations for the use of Toronto Terminals Railway right-of-way between approximately Bay Street and the Don River, and the reconstruction of a Hydro Electric Power Commission high voltage power line. Difficulties in acquiring this right-of-way could impede progress in the implementation of the proposed alignment and an alternative position is recommended. This alternative position involves an alignment through the Central Area along Wellington and Front Streets from Spadina Avenue to the Don River, where the line then becomes common with the recommended route.

In terms of service, the Wellington alignment is comparable to the Front Street route. The Wellington Street route is more consistent with planning policies than is the King option and impacts during construction would be less severe along Wellington, which is a four lane, one-way street with limited streetcar service compared to along King Street, which is a two-way street and a higher volume surface transit route.

The recommended alignment and alternative alignment are shown on Exhibit 7.1.

Yard Requirements

Both the recommended alignment and the alternative alignment involve yard requirements in the vicinity of Eastern Avenue and Pape Avenue, and the Study recommends that TTC take action to protect any lands necessary for this yard facility. Upon approval of a specific DRT alignment and securing the proposed 6.5 hectare Eastern Avenue yard site, TTC can then release their interests in property being held for yard purposes in the vicinity of Kipling Subway Station. That property is the 6.7 hectare component of the Westwood Theatre site, which can then be developed as part of the proposed Kipling-Islington Centre in Etobicoke.



D.R.T. RECOMMENDED
ALIGNMENT & ALTERNATIVE ALIGNMENT
EXHIBIT 7.1

Official Plan Amendments

Implementation of either the recommended alignment or the alternative alignment will be conditional upon revisions being made to the Metro Official Plan, and therefore, the Study recommends that action be taken to incorporate the necessary revisions into the Official Plan. These revisions can be brought forward and considered as part of the overall review of rapid transit priorities.

Possible Extensions

THE NORTH EXTENSION TO EGLINTON-DON MILLS

A northerly extension of the east leg of the Downtown Rapid Transit line to Eglinton Avenue would become a transportation consideration if the Yonge Subway north of Bloor becomes overcrowded, or if surface transit cannot adequately serve future growth of a proposed Centre in East York at Thorncliffe Park, and the Don Mills-Eglinton office park area. The Downtown Rapid Transit extension to Eglinton would reduce the demand on the Yonge Subway by providing an alternative rapid transit route for downtown destined bus passengers on Lawrence and Eglinton Avenues and would provide transportation support for the commercial and residential development of Thorncliffe Park, Flemingdon Park and the office park area of Eglinton-Don Mills.

THE WEST EXTENSION TO BLOOR-DUNDAS

The westerly extension of the Downtown Rapid Transit line may be needed to relieve potential overcrowding of the Bloor Subway west of Spadina Station, or to relieve traffic snarled downtown west streetcar lines.

The Eglinton West Rapid Transit Study Report 4.01 forecasts a Level of Service F on the Bloor Subway by the year 2001, if relief facilities are not built. This relief to future overcrowding on the Bloor Subway can be achieved by building either the Eglinton West Rapid Transit line or the west leg of the Downtown Rapid Transit line connecting to Dundas West Station with possible further extension north to Eglinton Avenue. These two options are discussed further in EWRT Report 4.03 - Summary Report.

The mixed traffic operation of streetcars on King Street and Queen Street West has led to an unsatisfactory level of service and an inefficient transit operation. This situation could be improved through transit priority measures on Queen Street and King Street. However, these measures would restrict auto movement, and parking and loading for local businesses, and thus, would be introduced at the expense of auto traffic. Extending the DRT line westerly from Spadina Avenue to a transit terminal at Roncesvalles and Queen would offer a faster trip into downtown Toronto for existing transit patrons on Roncesvalles and The Queensway. The DRT extension west of Spadina involves an alignment along the proposed Front Street (roadway) extension. It is recommended that the right-of-way necessary for rapid transit be protected in any implementation of the Front Street extension.

Possible routes for future extensions to the north-east or north-west are shown on Exhibit 7.2.

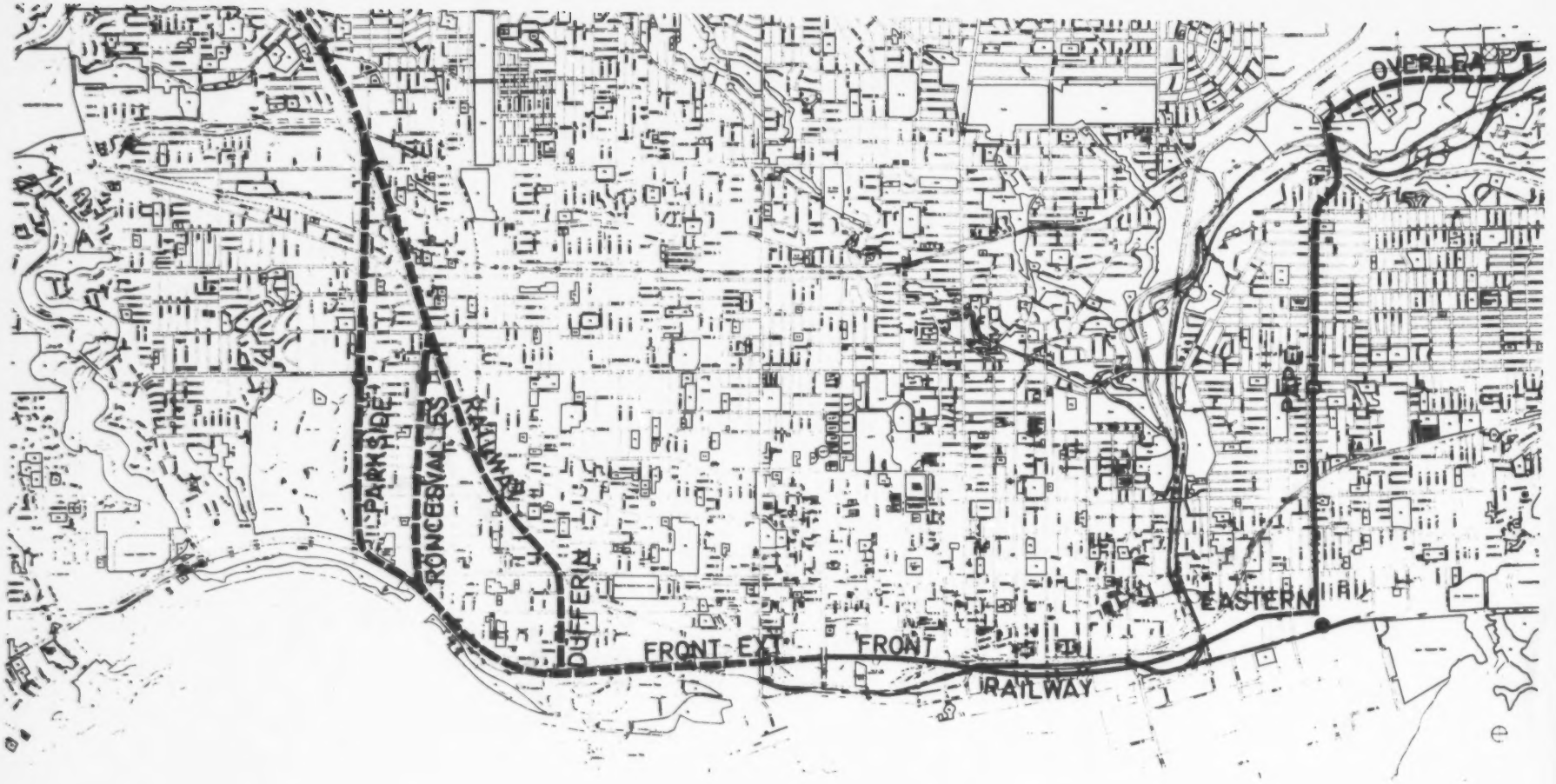
Implementation

The downtown relief facilities recommended in this report will cost an estimated $538 M to $568 M in capital costs (1984 $) depending upon options selected, and will require five years of engineering and construction to complete, following project approval by the Council of Metropolitan Toronto.

The options include additional stations at Lower Sherbourne and Gerrard/Pape that may be constructed for local access to the system. The implementation schedule provides for obtaining provincial approvals required under the Ontario Municipal Act and the Environmental Assessment Act; engineering, including selection of vehicle types; and construction, including pre-service testing.

The financial impacts of the program on budgets, taxes and employment generated, together with the implementation schedule, are discussed in more detail in Appendix C of this report.

The terms of reference for the DRT Study require an assessment of the cost of making the system accessible to the transportation handicapped. TTC policy on this issue is to provide parallel service (Wheel-Trans) for the transportation



● Associated DRT Yard Site

Possible Extensions West of Spadina and North of Bloor-Danforth

Recommended Alignment

D.R.T. POSSIBLE EXTENSIONS
EXHIBIT 7.2

handicapped. A review of TTC policy, and a cost estimate for making the DRT system accessible, is contained in DRT Report 2.02 - Alternative Solutions. The estimated additional cost is $4.5 million.

Technology

The question of technology is not an essential factor in the conclusion of this Study. The Study assumed an ICTS technology to provide a framework for geometric planning and environmental impact evaluation. However with a limited number of changes in geometry a subway technology could be readily adopted.

The only essential question in selecting technology will be the question of line capacity. Ridership studies by the Planning Department of Metro Toronto have forecast ridership on a new line into the downtown of approximately 16,000 passengers per hour on an average annual basis, and 18,000 passengers per hour on a peak season basis by the year 2001.

These passenger loads dictate a fully grade separated rail transit system using conventional subway or the Scarborough Rapid Transit type vehicles. The choice of technology, however, is more an operational than a planning matter.

APPENDIX A

Evaluation Summary
of
Central and Eastern Section Alignment Options

APPENDIX A

Evaluation of Central and Eastern Section Alignment Options

A detailed evaluation of the alternative alignments is presented in DRT Report 2.02 - Alternative Solutions. A summary of that evaluation is presented in Exhibits A.1 and A.2 for the Central and Eastern Sections, respectively. The positive and negative attributes of the options are summarized under the general criteria:

Transit Service
Policy Considerations
Economics
Environmental Impact
Implementaion.

EXHIBIT A.1

DOWNTOWN RAPID TRANSIT

CONSOLIDATED EVALUATION MATRIX

CENTRAL SECTION
(Spadina to Don River)

EVALUATION CRITERIA	OPTIONS					
	Queen	King	Wellington	Front-* Railway	Railway	Bay LRT
Potential Diversion of Existing Yonge-University and Danforth Subway Trips	●	●	●	●	○	▲
Service to Existing Employment Locations	●	●	●	●	○	●
Service to Future Employment Locations	○	▲	●	●	●	▲
Integration With Other Existing/ Proposed Transit Services	▲	▲	▲	●	▲	●
Long Term Policy Compliance	○	▲	▲	▲	▲	○
Capital Costs	▲	▲	▲	▲	▲	●
Operating Costs	▲	▲	▲	▲	▲	●
Environmental Impact	○	▲	●	●	●	●
Implementation	○	○	▲	▲	●	○

● - Positive Characteristics/Good

▲ - Neutral/Fair

○ - Negative Characteristics/Poor

*Front-Railway alignment option can be constructed as either an underground or elevated system. If elevated, it would be rated as Poor (○) under Environmental Impact and Good (●) under Implementation.

EXHIBIT A.1 NOTES
SUMMARY OF CENTRAL SECTION EVALUATION

A. Transit Service

QUEEN

- Good relief to Yonge-University and Danforth Subway lines.
- Too far north to effectively serve future Central Area office employment locations.
- Connects with Yonge-University Subway line at Queen and Osgoode Stations.

KING

- Good relief.
- Provides best service to existing, and fair service to future employment locations.
- Connects with Yonge-University Subway line at King and St. Andrews Stations.

WELLINGTON

- Good relief.
- Good service to existing and future employment locations.
- Connects with Yonge-University Subway line at King and St. Andrews Stations.

FRONT (UNDERGROUND OR ELEVATED)

- Good relief.
- Good service to existing, and excellent service to future employment locations, resulting in very good service to the combination of existing and future employment locations.
- Connects with Yonge-University Subway line, GO Transit, and proposed Harbourfront LRT, at Union Station.

RAILWAY

- Poor relief to Yonge-University and Danforth Subway lines.
- Too far south to effectively serve existing employment locations.
- Connection with Union Station south of railway tracks does not accommodate free-body transfer from DRT to Subway.

BAY LRT

- Provides some relief to Yonge and University Subway lines. No relief to Bloor-Danforth line.
- Good service to Central Core; does not provide service to emerging development areas west of University Avenue.
- Assumed to operate as an extension of proposed Harbourfront LRT.

B. Policy Considerations

All options require amendment to Metro Official Plan. Other policy considerations respecting the Queen and Bay LRT options are:

QUEEN

- May conflict with City of Toronto policies to preserve low density residential neighbourhoods adjacent to the Central Core.
- Can connect to the Danforth only at Donlands Station, and therefore would conflict with Borough of East York land use policies for that area.

BAY LRT

- Does not comply with TTC Long Range Plan.
- Does not directly offer improved service to East York, whereas King, Wellington, Front and Railway options potentially connect with Pape Subway Station (East York's preference) and can be extended north to Don Mills/Eglinton.

C. Economics

	Capital Costs (Construction, Vehicles & Property)	Net System Annual Operating Costs
DRT Options	$459-582 M	$7.0-10.1 M
Bay LRT	$ 266 M	$2.0- 2.5 M

D. Environmental Impact

Major environmental issues associated with proposed alternatives into downtown are:

i) Development pressures inconsistent with existing planning policies, and

ii) Physical impact of elevated system on the quality of downtown Toronto urban form.

DEVELOPMENT PRESSURE

Need for DRT facility is being generated by an increasing dependency on transit for work trips into the downtown, with overall Central Area forecast employment levels remaining reasonably consistent with current planning policies.

It is not anticipated that the proposed new rapid transit facilities will additionally attract and centralize forecast employment to the Central Area from other areas of Metro Region.

Within the Central Area, the Front Street options best encourage development to locate in areas consistent with land use planning policies. Queen, and to some degree King, may encourage development to higher densities in areas adjacent to the Central Core that is not consistent with land use policies of the City.

ELEVATED

The Front-elevated option has the potential for severe environmental impact in the area of noise, vibration and visual intrusion and to be successful, places rigid demands on the technology and architecture proposed. Noise and vibration problems can be mitigated by adoption of ICTS technology.

E. Implementation

Presence of streetcar service, and two-way automobile traffic make Queen and King the most difficult alignments on which to maintain automobile and transit access during construction. The presence of shopping areas and theatre areas increase the degree of public nuisance during construction.

Limited streetcar service and one-way traffic on Wellington Street offers an advantage in staging construction operations.

Front-Railway alignment between Don River and Bay Street easiest to implement because it is primarily above grade and can be constructed with minimum disruption. Requires securing of right-of-way from Toronto Terminals Railway and reconstruction of high voltage HEPC power lines.

Front-Railway (elevated) alignment west of Bay requires property acquisition for elevated stations.

Front-Railway (underground) alignment west of Bay requires expansion of the existing Union Subway Station and improved pedestrian linkages.

Railway alignment through Railway Lands west of Bay Street depends on the timely removal of rail storage tracks and securing of right-of-way.

EXHIBIT A.2

DOWNTOWN RAPID TRANSIT

CONSOLIDATED EVALUATION MATRIX

EASTERN SECTION
(Don River to Danforth)

EVALUATION CRITERIA	OPTIONS		
	Don Valley (Broadview)	Pape-Eastern	Donlands Railway
Potential Diversion of Existing Yonge-University and Danforth Subway Trips	●	●	▲
Integration With Other Existing/ Proposed Transit Services	▲	●	▲
Long Term Policy Compliance	▲	▲	○
Capital Costs	○	●	●
Operating Costs	▲	▲	▲
Environmental Impact	○	●	▲
Implementation	○	▲	○

● - Positive Characteristics/Good

▲ - Neutral/Fair

○ - Negative Characteristics/Poor

EXHIBIT A.2 NOTES
SUMMARY OF EASTERN SECTION EVALUATION

A. Transit Service

PAPE-EASTERN OPTION

- Connects with Pape Subway Station, which serves an established high volume bus corridor operating on reserved lanes.

DONLANDS-RAILWAY OPTION

- Connects with Donlands Station and would attract fewer riders from the Danforth Subway line. Bus handling capacity at Donlands is quite limited.

DON VALLEY OPTION

- Connects with Broadview Subway Station. Theoretically would attract more riders than Pape. However, this advantage may be offset by the inconvenient transfer from Broadview Station to the proposed DRT Station (15 metre vertical separation), and by a possible reluctance by passengers who transferred at Pape Station from a bus to the Danforth line to transfer again two stops later at Broadview.

B. Policy Consideration

- Major policy issue affecting the Eastern Section alternatives is the stated preference by the Borough of East York, as expressed in their draft Official Plan, for the DRT line to connect with the Danforth at Pape Station. In brief, East York's concerns relate to the destabilizing influence that a connection at Donlands would have on the surrounding predominately low density residential area.

C. Economics

- Don Valley alignment does not offer a minimum cost at-grade option as originally had been anticipated.
- Donlands-Railway option requires use of Greenwood Subway storage yards for DRT vehicles. As a result, property owned in the vicinity of Kipling Subway Station would have to be retained in order to accommodate Bloor-Danforth Subway car storage displaced from Greenwood.
- See also Exhibit A.1 - Economics.

D. Environmental Impact

PAPE-EASTERN OPTION

- Minimum environmental impact of Eastern Section options. Because it is proposed to be constructed underground, the line would be compatible with adjacent land uses.

DONLANDS-RAILWAY OPTION

- Most significant environmental impact associated with this alignment is the above mentioned development pressures in the vicinity of Donlands/Danforth.
- Elevated structure along CN Railway Corridor would result in visual impacts.

DON VALLEY OPTION

- Construction of a rapid transit line through the Don Valley would result in both temporary and permanent disruptions to the natural ravine and parkland environment.

E. Implementation

PAPE-EASTERN OPTION

- Requires purchase of private property in the vicinity of Pape and Eastern Avenues for yard site.
- Involves cut and cover construction on both Eastern and Pape Avenues, requiring surface decking and traffic restrictions to maintain traffic access during construction.

DONLANDS-RAILWAY OPTION

- This alignment would require acquisition of a three to four metre strip of land on the south side of the CN railway right-of-way between Eastern Avenue and Leslie Street for temporary construction access and permanent placement of support columns. This would affect adjacent residential, commercial and recreational properties.
- Requires construction of a unique elevated structure cantilevered over railway property.

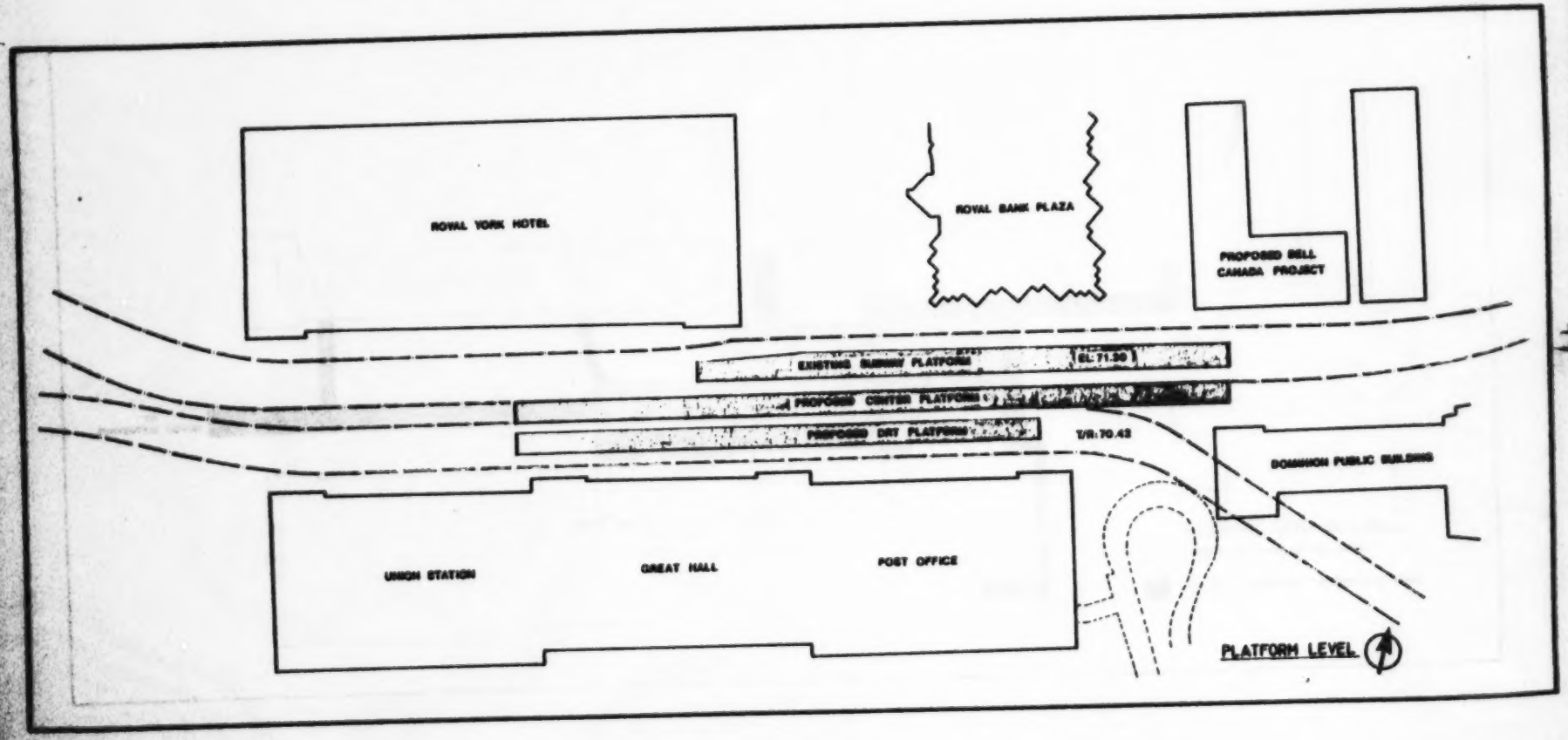
DON VALLEY OPTION

- Although all alternatives involve construction difficulties, the Don Valley alternative may require temporary diversions of the Don River, special construction techniques to minimize damage to the natural environment, and possible underpinning of bridge structures. Since the Valley lands are sensitive to erosion and flooding, special care would have to be taken to minimize soil loss from embankments when vegetation is removed during construction, and the construction site would have to be protected against flooding.

In terms of flexibility, the Don Valley route is an undesirable choice. The yard site associated with it is the least assured with respect to availability, because it was recently purchased by a developer who has applied to east York for approval of a major commercial/residential development.

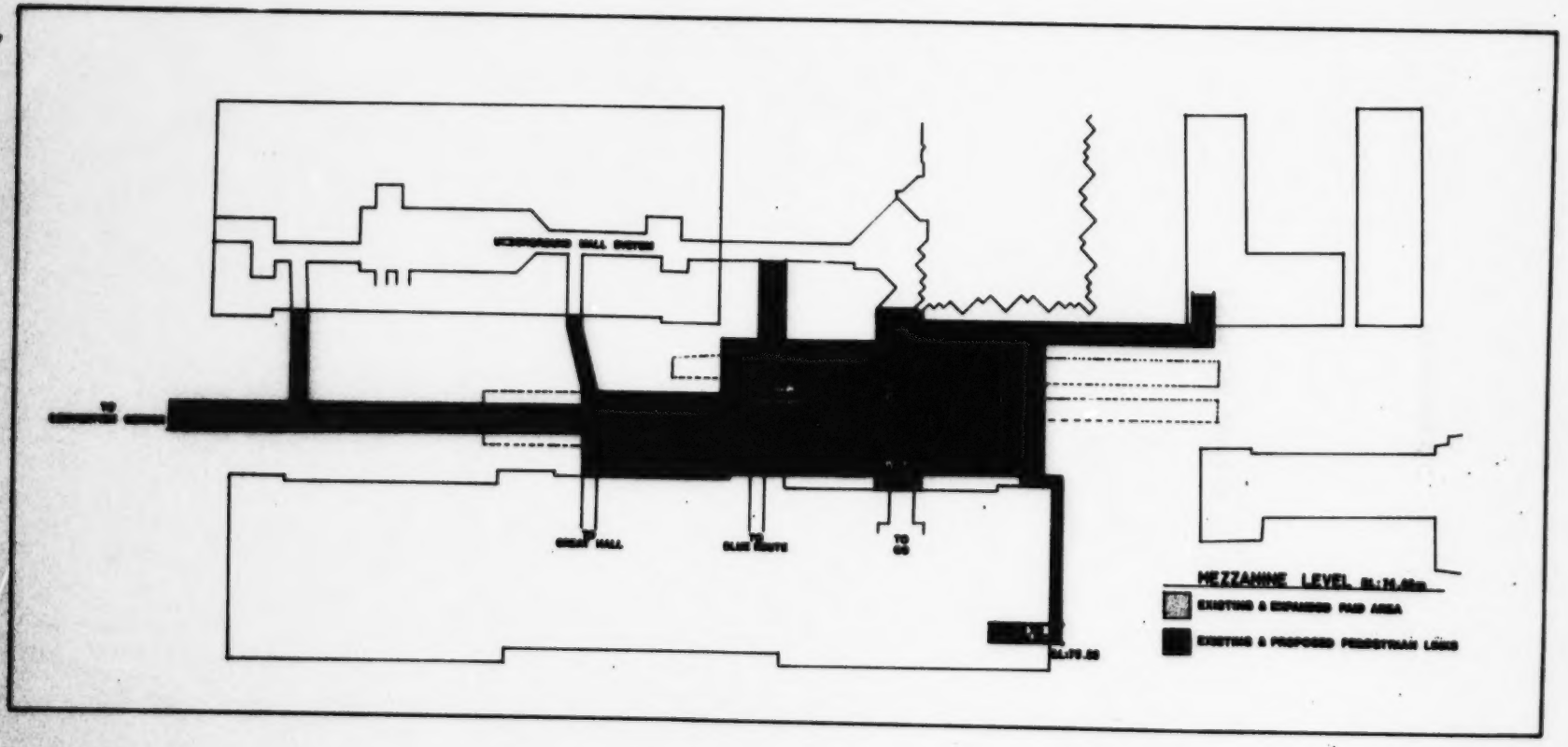
APPENDIX B

Description of DRT Connection at Union Station



DRT CONNECTION AT UNION STATION

EXHIBIT B.I



DRT CONNECTION AT UNION STATION
EXHIBIT B.2

EXHIBIT B'S

DET. CONNECTION AT SWITCH STATION

APPENDIX C

Financial Analysis

APPENDIX C

FINANCIAL ANALYSIS OF RECOMMENDED AND ALTERNATIVE ALIGNMENTS

Capital Costs

BASE YEAR

All capital costs are in 1984 dollars and are based on either local 1984 construction costs or the most recent tenders for similar products and services.

WORK INCLUDED

Work included in the construction cost estimates contained in Exhibit C.1 is based on project plans by the Engineering and Construction Branch of the Toronto Transit Commission and include the following items:

- Civil Works
- New and Reconstructed Utilities
- Station and Structures
- Power and Communication
- Signalling and Train Control
- Trackwork
- Engineering
- Project Management.

EXHIBIT C.1

SUMMARY OF COST ESTIMATES
FOR RECOMMENDED ALIGNMENT AND ALTERNATIVE ALIGNMENT

	Front-Pape Underground		Wellington-Pape	
Construction Costs	$ 407 M[1]		$ 416 M	
Vehicle Costs	$ 108 M		$ 108 M	
Property Costs	$ 23 M		$ 22 M	
Total Basic Costs	$ 538 M	($ 33.6M)	$ 546 M	($ 34.1M)
Options:				
Gerrard Station	$ 19 M		$ 19 M	
Sherbourne Station	$ 11 M		$ 19 M	
TOTAL WITH OPTIONS	$ 568 M	($ 35.4 M)	$ 584 M	($ 36.4M)

1. Includes Union Subway Station reconstruction

($ M) - Annualized cost assuming 12% interest rates, 6% inflation, 50 years amortization period for construction and property costs, and 30 years for vehicles.

Operating Costs

Annual costs for operating the DRT line have been estimated by TTC Corporate Planning. Net operating costs for both the recommended alignment and alternative alignment are $10.1 million per year expressed in 1984 dollars. Combined annualized capital and annual operating costs are $43.7 million and $44.2 million for the Front-Railway and Wellington-Front alignments, respectively.

These costs are based on providing peak hour capacity of 20,000 passenger per hour and off-peak capacity of 4,100 passengers per hour. Other factors used in the determination of operating costs are given in Exhibit C.2.

Impact on TTC Capital Works Programme

Analysis of the impact of the estimated investment required to implement the DRT project is based on a five year implementation program as shown on Exhibit C.3. The program has been assumed to start with the project approved by Metro Council and assumes constant 1984 dollars.

Exhibits C.4 and C.5 show the impacts on the TTC five year Capital Works Programme of the recommended Front Street and alternative Wellington Street alignments, respectively.

Construction Benefits and Employment

Exhibit C.6 shows construction benefits and employment derived from implementation of the recommended alignment.

EXHIBIT C.2

DOWNTOWN RAPID TRANSIT OPERATING COSTS

Recommended Alignment and Alternative Alignment

Round Trip Distance (km)		15.5		
		Peak	Off Peak	
Average Speed (km/hr)		38	39	
Round Trip Time (Minutes:seconds)		24'30"	24'00"	
Line Capacity		20,000	4,100	
Vehicle Capacity		170	70	(Seated Load)
Headways	4-Car train	2'02"	4'06"	
Vehicles	Scheduled	48		
	Total (including spares)	54		

* * * * *

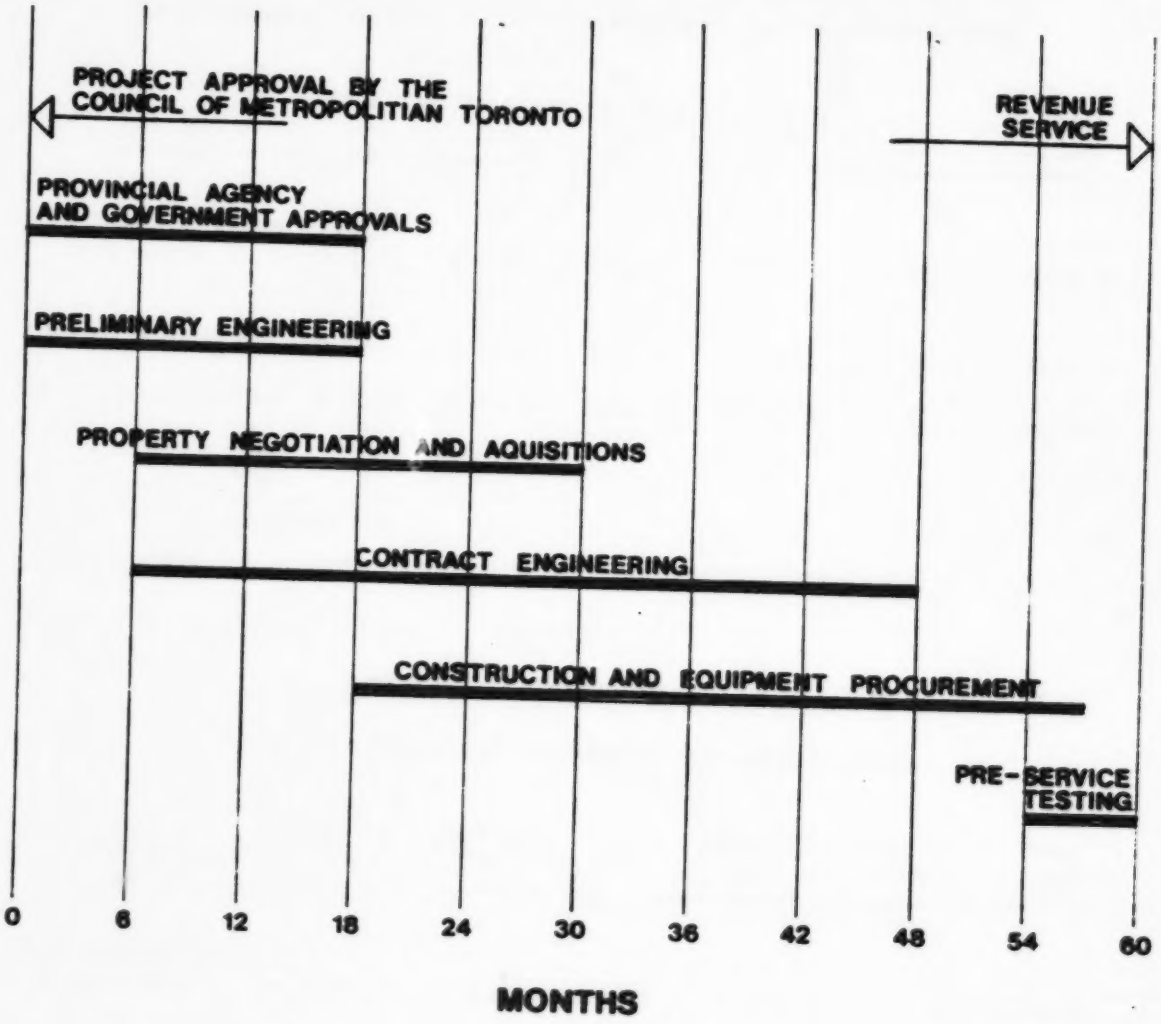
Operating cost savings arising from service adjustments on connecting surface routes[1] $ 2.5 M

Annual Operating Costs	Gross DRT Costs	Net System Costs
4-Car (Stretched) ICTS Train	$ 12.6 M	$ 10.1 M

1. Service adjusted on following routes:

Flemingdon Park	(100)	Bus
Broadview	(8)	Bus
Carlton	(506)	Streetcar
Queen	(501)	Streetcar
Downtown	(502)	Streetcar
King	(504)	Streetcar
Sherbourne	(75)	Bus
Church	(19)	Bus

EXHIBIT C.3



DOWNTOWN RAPID TRANSIT PROJECT
PROPOSED IMPLEMENTATION SCHEDULE

EXHIBIT C.3

EXHIBIT C'3

EXHIBIT C.4

IMPACT ON TTC CAPITAL WORKS PROGRAMME*

($Millions - 1984 Dollars)

Recommended Alignment - Front (underground)-Railway-Eastern-Pape

Distribution	Year 1 5%	Year 2 25%	Year 3 30%	Year 4 25%	Year 5 15%	Total 100%
TTC Capital Works Programme	$ 26.9	$134.5	$161.4	$134.5	$ 80.7	$538.0
Metro Share (25%)	$ 6.7	$ 33.6	$ 40.4	$ 33.6	$ 20.2	$134.5
Prov.Subsidy (75%)	$ 20.2	$100.9	$121.0	$100.9	$ 60.5	$403.5

EXHIBIT C.5

IMPACT ON TTC CAPITAL WORKS PROGRAMME

Alternative Alignment - Wellington-Front-Eastern-Pape

Distribution	Year 1 5%	Year 2 25%	Year 3 30%	Year 4 25%	Year 5 15%	Total 100%
TTC Capital Works Programme	$ 27.3	$136.5	$163.8	$136.5	$ 81.9	$546.0
Metro Share (25%)	$ 6.8	$ 34.1	$ 41.0	$ 34.1	$ 20.5	$136.5
Prov.Subsidy (75%)	$ 20.5	$102.4	$122.8	$102.4	$ 61.4	$409.5

*Capital costs for optional stations at Gerrard/Pape and at Sherbourne are not included.

EXHIBIT C.6
SUMMARY OF CONSTRUCTION BENEFITS AND EMPLOYMENT RESULTING FROM IMPLEMENTATION OF RECOMMENDED FRONT (UNDERGROUND)-RAILWAY-EASTERN-PAPE ALIGNMENT

	Vehicle Investments[5]	Fixed Plant Investment[6]	Total
Employment Generated (Person-Years)			
Direct[1]/Indirect[2]	1,787	7,694	9,481
Induced[3]	706	4,613	5,319
Total	2,493	12,307	14,800
Employment Income Generated ($ Thousands)			
Direct/Indirect	$ 43,846	$199,741	$243,587
Induced	$ 17,029	$ 80,286	$ 97,315
Total	$ 60,875	$280,027	$340,902
Business Net Income Generated ($ Thousands)			
Direct/Indirect	$ 31,788	$ 80,268	$112,056
Induced	$ 10,062	$ 66,376	$ 76,438
Total	$ 41,850	$146,644	$188,494
Taxes Generated[4] ($ Thousands)			
Direct/Indirect	$ 29,133	$101,033	$130,166
Induced	$ 11,905	$ 65,524	$ 77,429
Total	$ 41,038	$166,557	$207,595

NOTES:

1. Direct impact level refers to those economic activities taking place at the site of construction or vehicle assembly.
2. Indirect impact encompasses all of the interdependent inputs and outputs required to support the direct (site) activities, e.g. concrete, steel, etc.
3. The induced impact is a measure of the economic effects of increased household spending due to project generated employment income.
4. Taxes generated include Federal and Provincial income and corporate taxes; Federal, Provincial and Local commodity indirect and other indirect taxes. Total Federal, Provincial and Local taxes are proportioned 68%, 24% and 8%, respectively.
5. Based on vehicle cost of $108 M.
6. Based on preliminary construction cost estimate of $440 M, which includes optional stations at Gerrard/Pape and Lower Sherbourne.

SOURCE: R. S. Wallace and Associates Limited

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